

U.S. Appln No. 10/720,005
Page 2

Amendments to the Specification:

Please replace the paragraph beginning at column 1, lines 47-51 with the following rewritten paragraph:

In an H_2 - O_2 /air PEM fuel cell environment, the bipolar plates and other contact elements (e.g., end plates) are in constant contact with highly acidic solutions (pH 3-5) containing F^- , $[SO_4^{---}]$, SO_4^{--} , SO_3^- , HSO_4^- , $[CO_3^{---}]$, CO_3^{--} and HCO_3^- , etc. Moreover, the cathode operates in a highly oxidizing environment, being polarized to a maximum of about +1 V (vs. the normal hydrogen electrode) while being exposed to pressurized air. Finally, the anode is constantly exposed to super atmospheric hydrogen. Hence, contact elements made from metal must be resistant to acids, oxidation, and hydrogen embrittlement in the fuel cell environment. As few metals exist that meet this criteria, contact elements have often been fabricated from large pieces of graphite which is corrosion-resistant, and electrically conductive in the PEM fuel cell environment. However, graphite is quite fragile, and quite porous making it extremely difficult to make very thin gas impervious plates therefrom.

U.S. Appln No. 10/720,005

Page 3

Please replace the paragraph beginning at column 4, line 46, with the following rewritten paragraph:

In accordance with the present invention, and as best shown in FIG. 4, the working faces 59 and 63 of the bipolar plate are covered with an electrically conductive, [oxidation resistant] oxidation-resistant, and acid-resistant protective coating 94 having a resistivity less than about 50 ohm-cm, and comprising a plurality of oxidation-resistant, acid-insoluble, conductive particles (i.e. less than about 50 microns) dispersed throughout an acid-resistant, oxidation-resistant polymer matrix. Preferably, the conductive filler particles are selected from the group consisting of gold, platinum, graphite, carbon, nickel, conductive metal borides, nitrides and carbides (e.g. titanium nitride, titanium carbide, titanium diboride), titanium alloyed with chromium and/or nickel, palladium, niobium, rhodium, rare earth metals, and other noble metals. Most preferably, the particles will comprise carbon or graphite (i.e. hexagonally crystallized carbon). The particles comprise varying weight percentages of the coating depending on the density and conductivity of the particles (i.e., particles having a high conductivity and low density can be used in lower weight percentages). Carbon/graphite containing coatings will typically contain 25 percent by weight carbon/graphite particles. The polymer matrix comprises any water-insoluble polymer that can be formed into a thin adherent film and that can withstand the hostile oxidative and acidic environment of the fuel cell. Hence, such polymers, as epoxies, silicones, polyamide-imides, polyether-imides, polyphenols, fluoro-elastomers (e.g., polyvinylidene fluoride), polyesters, phenoxy-phenolics, epoxide-phenolics, acrylics, and urethanes, [inter alia] inter alia are seen to be useful with the present invention. Cross-linked polymers are preferred for producing impermeable coatings.

U.S. Appln No. 10/720,005
Page 4

Please replace the paragraph beginning at column 6, line 52, with the following rewritten paragraph:

Some coatings may be pervious to the cell's hostile environment. [Previous] Pervious coatings are used directly only on oxidizable metals (e.g., titanium or stainless steel) and not directly on metals that are susceptible to dissolution in the fuel cell environment (e.g., aluminum). Pervious coatings could however be used on dissolvable metal substrates (e.g., Al) which have first been coated or clad with an oxidizable/passivating metal layer (e.g., titanium or stainless steel). When pervious coatings are used on an oxidizable/passivating substrate or coating, oxides will form at the sites (i.e., micropores) where the coating is pervious, but not at sites where the polymer engages the substrate metal. As a result, only a small portion of the surface is oxidized/passivated ([i.e.] i.e. at the micropores in the coating) resulting in very little increase in electrical resistance attributable to the oxide formation.

U.S. Appln No. 10/720,005

Page 5

Please replace the paragraph beginning at column 7, line 1, with the following rewritten paragraph:

According to one embodiment of the invention, the electrically conductive polymer coating is applied to an acid-dissolvable substrate metal (e.g., Al) which had previously been coated with a layer of oxidizable/passivating metal such as stainless steel. In this regard, a barrier/protective layer 96 of a metal that forms a low resistance, passivating oxide film is deposited onto the substrate 98, and is covered with a topcoat of conductive polymer 54 in accordance with the present invention. Stainless steels rich in chromium (i.e., at least 16% by weight), nickel (i.e., at least 20% by weight), and molybdenum (i.e., at least 3% by weight) are seen to be excellent such barrier/protective layers 96 as they form a dense oxide layer at the sites of the micropores in the polymer coating which inhibits further corrosion, but which does not significantly increase the fuel cell's internal resistance. One such stainless steel for this purpose is commercially available from the Rolled Alloy Company as alloy Al-6XN, and contains $23\pm 2\%$ by weight chromium, $21\pm 2\%$ by weight nickel, and $6\pm 2\%$ by weight molybdenum. The barrier/protective stainless steel layer is preferably deposited onto the metal substrate using conventional physical vapor deposition (PVD) techniques (e.g., sputtering), or chemical vapor deposition (CVD) techniques known to those skilled in [these] the art. Alternatively, electrolessly deposited nickel-phosphorous alloys appear to have good potential as a substitute for the stainless steel in that they readily form a passivating film when exposed to the fuel cell environment which provides a barrier to further oxidation/corrosion of the underlying coating.